EXPEDITION MARS
CHALLENGER CENTER

The year is 2076. A handful of facilities have been established on Mars, including a greenhouse, a mobile geological survey base, and a centralized research habitat. The primary human habitat is not on Mars, but on one of its moons, Phobos. A large shuttle regularly ferries astronauts and scientists between the base on Phobos and the surface of Mars. This shuttle, or Mars Transport Vehicle (MTV), carries parts to build a remotely operated vehicle (ROV) to continue the search for the evidence of life and water. However, when crew members discover an imminent threat to their MTV and the Martian surface facilities, they must act quickly to save their stations, their research, and their lives.

SUGGESTED FOR
GRADE 6

Challenger® CENTER

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MISSION GOAL

The students will work together to search for evidence of life and water on Mars.

MEASURED STUDENT IMPACTS

- STEM Engagement: Increase student engagement in STEM
- STEM Self-Efficacy: Increase student feeling that they can "do STEM"
- STEM Career Awareness: Increase students awareness of a range of STEM careers
- 21st Century Skills: Increase student communication, collaboration, and problem solving skills

MAJOR STEM CONCEPTS

- Finding water is a precursor for finding life.
- Collision of objects in space can cause geological changes.
- Without the Earth's protective atmosphere, radiation levels are higher.
- Advanced programming of robots aid in science exploration.

IMPACT DATA

- 94% of students said that they learned just as much, or more than they do in their classroom.
- Students gave it a 2.84/3 for "Expedition Mars is a valuable learning experience."
- 93% of students would recommend visiting a Challenger Learning Center to a friend.

HANDS-ON LABS

- Investigate the characteristics of minerals to discover if any were formed in water.
- Build and program the ROV.
- Check vital signs and radiation levels of crew members.
- Test oxygen levels in Martian soil.

TEAMS

One member of each team will be in Mission Control for the first half of the mission while the other is assigned to the Mars Transport Vehicle (MTV). At the midpoint of the experience, the group in Mission Control launches to the MTV and the MTV group returns to work in Mission Control.

	DESCRIPTION	OBJECTIVES
	Maintain and manage all communications between Mission Control and the MTV; Serve as mission "leader."	Provide communications support between the MTV and Mission Control.
	Pilot and ensure the stability of the MTV on its journey to the surface of Mars.	Calculate and plot the course for the MTV to navigate to Mars from Phobos.
	Assemble the inner hardware of the remotely operated vehicle that will explore the surface of Mars.	Build and test a remotely operated vehicle ROV to search for signs of water.
	Monitor the Martian atmosphere for dangerous objects and potential severe weather.	Locate a missing satellite and track other objects in the Martian sky.
	Monitor the health of the crew through various diagnostic tests.	Assess the health of the crew based on their radiation levels.
	Analyze soil to determine if life could exist on Mars.	Test soil to determine if microbes are present.
	Perform rudimentary programming to help direct the ROV team to the correct exploration sites.	Program the remotely operated vehicle to navigate the Martian terrain.
	Maintain a closed-loop environment to ensure the health and safety of all team members on the MTV.	Constantly monitor and check all life support systems, including air pressure, temperature, and humidity.
	Classify minerals by performing scratch tests, streak tests, and visual observations.	Examine Martian minerals to determine if minerals were formed in water.

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Academic Paths and STEM Career Connections

	BRANCHES OF STUDY	CAREER CONNECTIONS
	Aerospace Engineering • Computer Engineering • Public Relations	Communication Engineer • Information Technologist
	Physics • Avionics Technology	Pilot • Navigator • Mathematician • Aerospace Engineer • Electrical Engineer
	Biology • Chemistry • Botany • Astrobiology	Astrobiologist • Botanist • Ecologist
	Computer Engineering • Electronic Engineering • Mechanical Engineering	Computer Scientist • Mechanical Engineer • Electrical Engineer • Aerospace Engineer
	Geology • Astrogeology	Planetary Geologist • Seismologist • Land Surveyor
	Aerospace Engineering Technology • Biology • Structural Engineering • Aerospace Engineering	Environmental Engineer • Chemist • Industrial Engineer
	Psychology • Biology • Doctor of Medicine • Physics • Chemistry	Physician • Nurse • Lab Technician • Physician Assistant
	Aerospace Engineering • Computer Engineering	Computer Scientist • Mechanical Engineer • Electrical Engineer • Structural Engineer
	Computer Engineering • Electronic Engineering • Mechanical Engineering	Electrical Engineer • Meteorologist • Solar Astronomer • Physicist

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National Standards

	NEXT GENERATION SCIENCE	COMMON CORE
	MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)
	MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually. WHST.6-8.1: Write arguments focused on discipline-specific content. MP.2: Reason abstractly and quantitatively. RST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
	MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually. RST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
	MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ETS1-2), (MS-ETS1-3) WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ETS1-2)
	MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually. MP.2: Reason abstractly and quantitatively. RST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.

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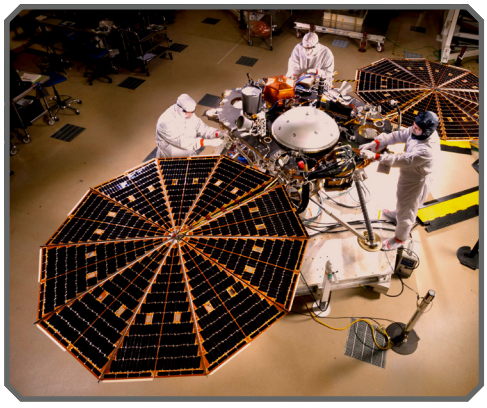
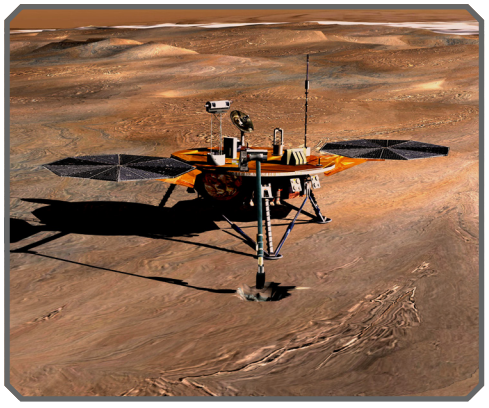
National Standards

	NEXT GENERATION SCIENCE	COMMON CORE
LS	MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. SL.8.5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. RST.6-8.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually. MP.2: Reason abstractly and quantitatively. RST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.
MED	MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	RST.6-8.1: /cite specific textual evidence to support analysis of science and technical texts. RST.6-8.2: Determine the central idea or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. RST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research.





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NEXT GENERATION SCIENCE	COMMON CORE
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ETS1-3) RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	WHST.6-8.7: Conduct short research projects to answer a question (including a self-generated question) drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. SL.8.5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points. MP.2: Reason abstractly and quantitatively.